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WARE FRESSOLA VAN DER SLUYS & ADOLPHSON, LLP
BRADFORD GREEN, BUILDING 5
755 MAIN STREET, P O BOX 224
MONROE, CT 06468

EXAMINER

KALAM, ABUL

ART UNIT

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2814

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/528,868

Applicant(s)

MUSSIG ET AL.

Examiner

ABUL KALAM

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 November 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 10-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- Paper No(s)/Mail Date _____

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 29, 2007, has been entered.

Claim Objections

2. Claims 2-7 are objected to because of the following:

In line 1 of claims 2-7, the limitation "a semiconductor component" should be amended to recite --The semiconductor component--, because the semiconductor component in claims 2-7 refers to "a semiconductor component," recited in claim 1. The limitation should be amended in order to avoid antecedent basis issues.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In line 6 of claim 1, the limitation of a "layer thickness of less than 5 nanometers," is considered indefinite, since the range does not clearly set forth the metes and bounds of the patent protection desired. In the instant case, the claimed range is not bounded

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by a lower limit, and thus, a thickness of 0 nm would read on the claimed range. In lines 2-3 of claim 2, the limitation of "a layer thickness of a maximum of 3 nanometers," also fails to provide a lower limit to the range. Claims 3-9 depend from claim 1, and thus, are also rejected for the same reasons.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. **Claims 1-4, 6, 8 and 9** are rejected under 35 U.S.C. 102(e) as being anticipated by Ahn et al. (US 2003/0228747; previously cited by Applicant).

Regarding claim 1, Ahn discloses a semiconductor component having a silicon-bearing layer ("**silicon based substrate**," ¶ [0041]) and a praseodymium oxide layer ("**Pr₂O₃**," ¶ [0041]) characterized in that arranged between the silicon-bearing layer and the praseodymium oxide layer is a mixed oxide layer ("**interfacial layer**," ¶ [0041]) containing silicon, praseodymium and oxygen ("**Pr-Si-O**," ¶ [0042]), which is of layer thickness of less than 5 nanometers (¶ [0041]).

Regarding claim 2, Ahn discloses wherein the mixed oxide layer ("**interfacial layer**," ¶ [0041]) is of layer thickness of a maximum of 3 nanometers (¶ [0041]).

Regarding claim 3, Ahn discloses wherein the mixed oxide layer ("**interfacial layer**," ¶ [0041]) is a pseudo-binary, non-stoichiometric silicate ("**Pr-Si-O**," ¶ [0042]).

Regarding claim 4, Ahn discloses wherein the mixed oxide layer ("**interfacial layer**," ¶[0040]-[0042]) is an alloy of the type $(\text{Pr}_2\text{O}_3)_x(\text{SiO}_2)_{1-x}$ (¶[0042]), and wherein x increases from a first value, at an interface of the mixed oxide layer with the silicon-bearing layer, to a second value, at an interface of the mixed oxide layer with the praseodymium oxide layer ("**Pr₂O₃**," ¶[0041]) (it is implicit that the percentage of praseodymium oxide, in the interfacial layer, increases near an interface with the praseodymium oxide layer).

Regarding claim 6, Ahn discloses wherein the silicon-bearing layer comprises doped or undoped silicon ("**silicon based substrate**," ¶ [0041]).

Regarding claim 8, Ahn discloses a MOSFET as set forth in claim 1 (¶ [0047]).

Regarding claim 9, Ahn discloses a memory cell as set forth in claim 1 (¶ [0049]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. **Claims 1-3 and 5-9** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Yu et al. (US 2002/0089023; previously cited, hereinafter Yu)**.

Regarding claim 1, Yu discloses in **Fig. 3**, a semiconductor component having a silicon-bearing layer **(301)** and a praseodymium oxide layer **(306)** characterized in that arranged between the silicon-bearing layer **(301)** and the praseodymium oxide layer **(305)** is a mixed oxide layer containing silicon, praseodymium and oxygen (**¶ [0037], [0039] and [0042]**).

Yu does not disclose wherein the mixed oxide layer has a thickness of less than 5 nanometers. However, absent evidence of disclosure of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to form the mixed oxide layer with a thickness in the range as claimed, because such a range may be formed through routine experimentation, for the purpose of obtaining the desired dielectric constant.

Regarding claim 2, Yu does not disclose wherein the oxide layer has a thickness of a maximum of 3 nanometers. However, absent evidence of disclosure of criticality for the range giving unexpected results, it is not inventive to discover optimal or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to form the mixed oxide layer with a thickness in the range

as claimed, because such a range may be formed through routine experimentation, for the purpose of obtaining the desired dielectric constant.

Regarding claim 3, Yu discloses wherein the mixed oxide (**305**) is a non-stoichiometric silicate (**¶ [0039]**).

Regarding claims 5 and 6, Yu discloses wherein the silicon-bearing layer (**301**) comprises silicon-germanium or silicon, respectively (**¶ [0037]**).

Regarding claim 7, Yu discloses wherein silicon-germanium layer or the silicon layer (**301**) has an (001) orientation at the interface to the mixed oxide layer (**¶ [0029]**, **the (001) and (100) orientations are symmetrical**).

Regarding claim 8, Yu discloses in **Fig. 3**, a MOSFET as set forth in claim 1.

Regarding claim 9, Yu discloses a memory cell (**¶ [0002]**) as set forth in claim 1.

Response to Arguments

6. Applicant's arguments filed November 29, 2007, have been fully considered but they are not persuasive.

With respect to the Yu reference, Applicant argues that the Examiner cannot assert that the "suitable element" for growing a layer of $\text{PrO}_{2-x}\text{N}_x$ is necessarily praseodymium oxide, or that the "suitable element" necessarily includes praseodymium in any combination. The argument is not persuasive because Yu states that the template layer **305** may include 1-10 monolayers of silicon, oxygen, **and an element suitable** to successfully grow layer **306** (**¶ [0039]**), and gives an example such a template layer (**Si-O-Sr or Si-O-N-Sr**, **¶ [0039]**), when layer **306** is $\text{SrTiO}_{3-x}\text{N}_x$.

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Applicant seems to ignore this example of template layer disclosed by Yu. Thus, it would be more than obvious to one of ordinary skill in the art, that if the layer **306** is $\text{PrO}_{2-x}\text{N}_x$, as disclosed by Yu in ¶ [0042], then the template layer must be Si-O-Pr or Si-O-N-Pr, based on the example provided in ¶ [0039]. Thus, it is not only obvious, but also implicit, that the "element suitable" to successfully grow a layer **306** of $\text{PrO}_{2-x}\text{N}_x$ (¶ [0042]), is praseodymium.

With respect to claim 1, Applicant also argues that layer **306** of Yu is a praseodymium "oxide-nitride" layer and thus is materially different from praseodymium oxide. The argument is not persuasive because the recitation of "praseodymium oxide layer," does not exclude the layer from having nitrogen. Note that the term "having" is similar to the term "comprising," in that the terms do not exclude the presence of other elements. It has been held that the use of the term "comprising" leaves a claim open for inclusion of material or steps other than recited in the claims. *Ex parte Davis*, 80 USPQ 448 (PTO Bd. App. 1948). Use of the term comprising does not exclude the presence of other elements. *In re Hunter*, 288 F. 2d 930, 129 USPQ 25 (CCPA 1961). Applicant also argues: "the Examiner is asserting that because what is claimed is not inconsistent with the teaching of a reference, the reference can be relied upon." The argument is not persuasive because the issue is not about whether what is claimed is consistent or "not inconsistent" with the teaching of a reference, but whether the reference teaches a structure that reads on the claimed invention. In the instant case, the $\text{PrO}_{2-x}\text{N}_x$ layer disclosed by Yu (¶ [0042]), reads on the limitation of a praseodymium oxide layer, because a layer of $\text{PrO}_{2-x}\text{N}_x$ comprises praseodymium oxide. Furthermore, note that the

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praseodymium oxide layer has not been limited, in the claim, to a layer only comprising praseodymium and oxygen.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abul Kalam whose telephone number is (571)272-8346. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. K./
Examiner, Art Unit 2814

/Phat X Cao/
Primary Examiner, Art Unit 2814